DEFORMING MECHANISMS IN Ti-5Al-5Mo-5V-ALLOY.

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Features of deformation of Ti-5Al-5Mo-5V-alloy with the different initial structure ensured by thermal treatment were investigated. Three initial structure states was studied: Single-phase β-state (annealing under 900^{o}C during 1 hour with the following cooling in water), two-phase state β + 15% α-phase (850^{o}C, 1.5 h), and β + 55 % α-phase (850^{o}C, 1.5 h + 750^{o}C, 3 h, air cooling). Then specimens were subjected uniaxial compression and hydroextrusion before 50% deformation. Studies of structure were realized by means of the Optical Metallography (OM), Transmission Electron Microscopy (TEM) and X-ray structure analysis (X-ray) methods.

Deforming a single-phase alloy occurred on the rotary mechanism. Orientationally connected with basic β – matrix the orthorhombic α″ - martensite was revealed by X-ray analysis after deforming the alloy on ε = 5 - 15%. Martensite was observed in form of plates and packages, having complex structure under TEM study. When compressive strain increase to ε = 30 – 50 % the martensite was not observed by X-ray but TEM shown the growing of areas with similar to martensite fragmentation structure. Obviously, the formation α''-martensite was occurred under developed plastic deformation, but then one had the quick inverse conversion. As a result the initial orientation does not saves and β- grain is appreciably fragmented.

Martensite was not observed at deforming a two-phase alloy with 15% α-phase (X-rays). Deformation was realized by twinning, number of twins was grown, as in α, so and in β phase. But behavior of structure of β + 55% α-alloy greatly changes at deforming. Method TEM shown a growing of disorientation inside grains and an appearance of extinctional borders. Within grain the area with fluent changing the orientation and curvatures of lattice, obstructing spreading the rifts, were found. Hence at this structure a deformation is realized on the bend mechanism.

Changing a deformation mechanism from rotary to bend leads to an essential changing of mechanical properties. So, for instance, a ductility increases from 40 before 60 %, but an elastic module increases on 35%. Use hydrostatic pressure in the process of deformation increases faultness of particles in the both phases that also perfects mechanical properties.